

LANDSAT IMAGE MOSAIC OF ANTARCTICA

S. Borg and T. Wagner, ***National Science Foundation***

R. Bindshadler and P. Vornberger (SAIC), ***NASA Goddard Space Flight Center***

D. Binnie, J. Paulson, B. Granneman, R. Headley, M. Buswell and many others at the
USGS EROS Data Center

A. Fleming, A. Fox, at the ***British Antarctic Survey***



- LIMA is an impressive achievement !
- However ... even ~1100 scenes selected from ~22,000 was not quite enough - we could use more
- Landsat mosaics have been made of other continents but Antarctica had been “dropped” due to cost
- L7 Antarctic data were collected due to the LST, and a glaciologist being on it
- NSF support of almost \$1 million, BAS support
- IPY was the catalyst

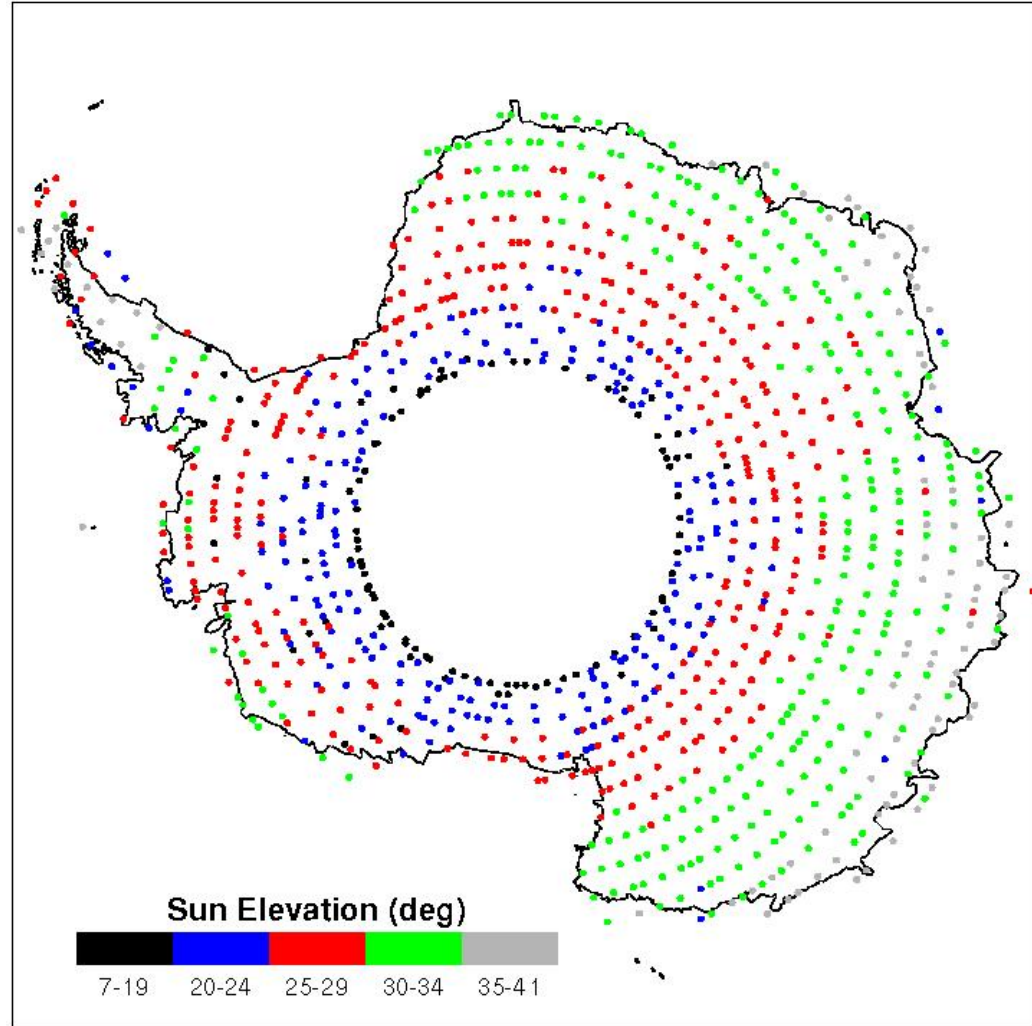
<http://www.ipy.org>

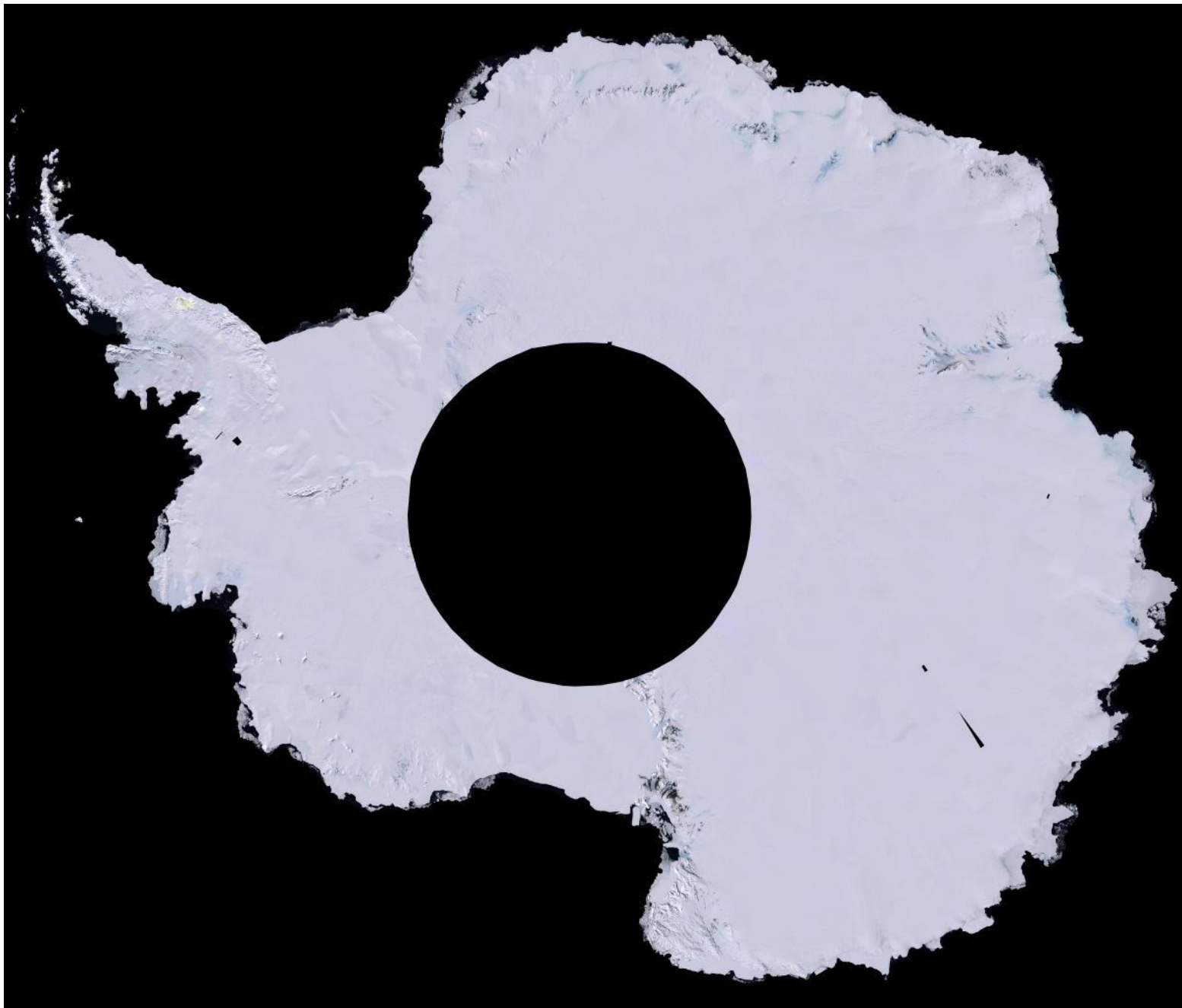


LIMA

- is an international collaboration
- would not have happened without the IPY
- is a benchmark data set - the first of IPY
- is available to everyone at no cost
- reaches the public with true-color product
- is also a scientific product

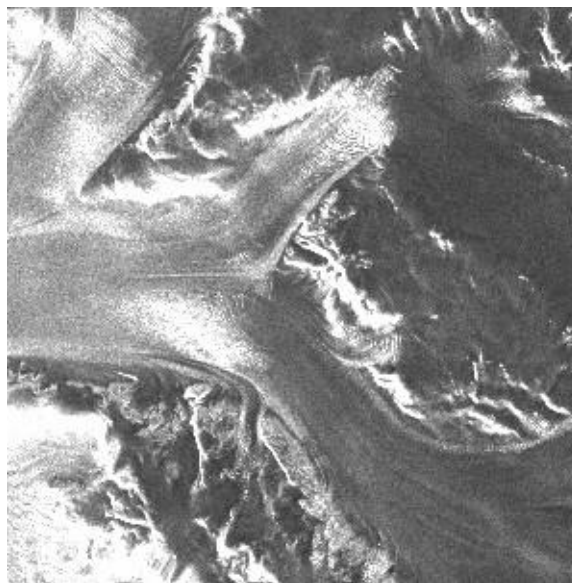
- 1073+ L7 ETM+ images
- only 39 are SLC-off
- most dated 1999-2003
- may include a few L4 & L5
- orthorectified using RAMP v2 DEM
- adjusted for:
 - saturation
 - sun elevation
 - non-Lambertian reflectance



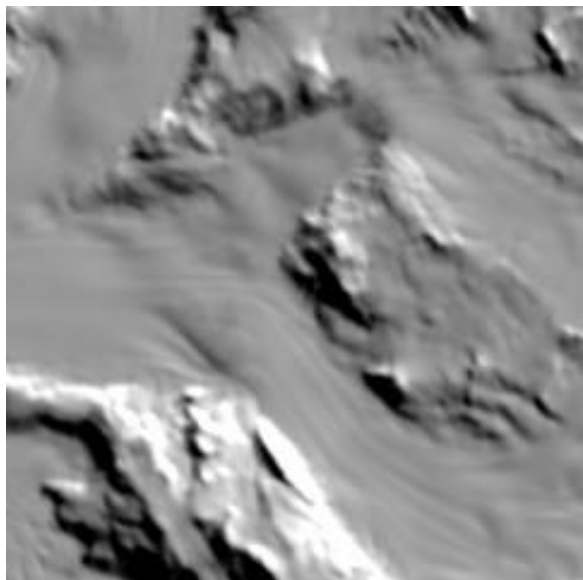




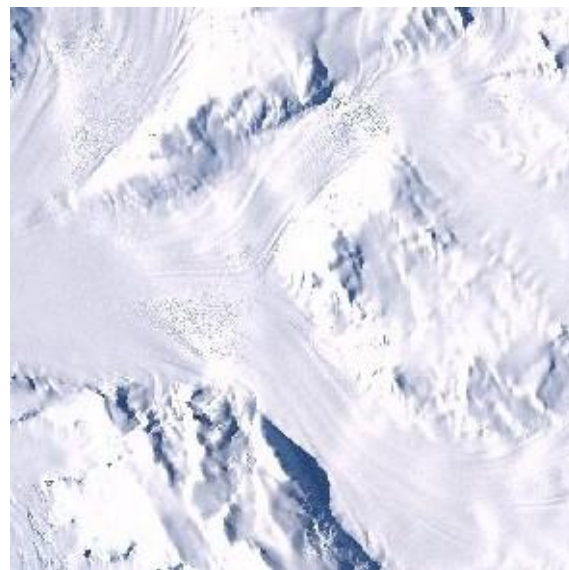
AVHRR (1990)



RADARSAT (1997)



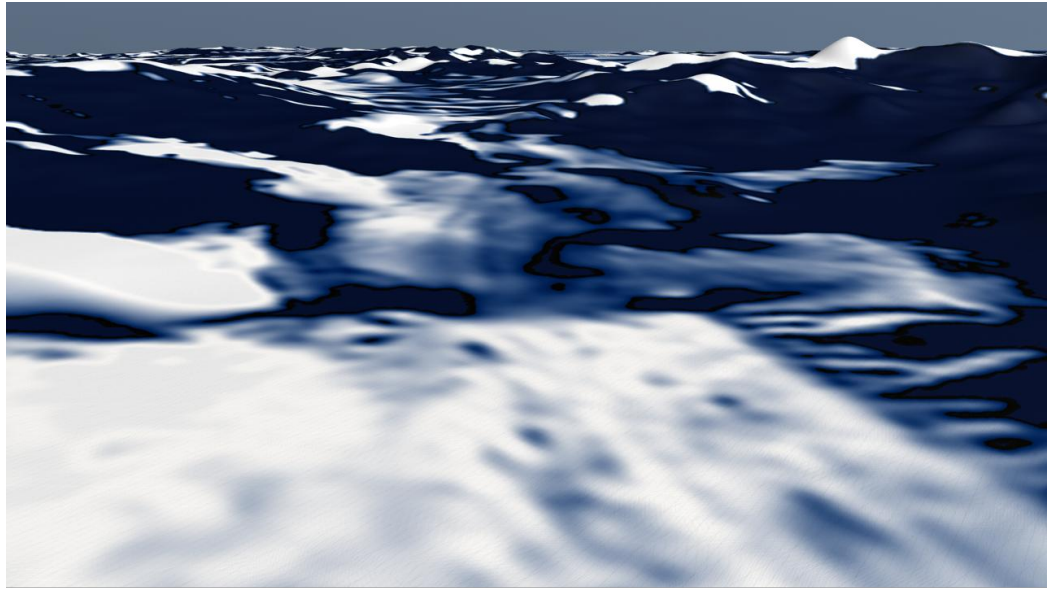
MOA (2005)



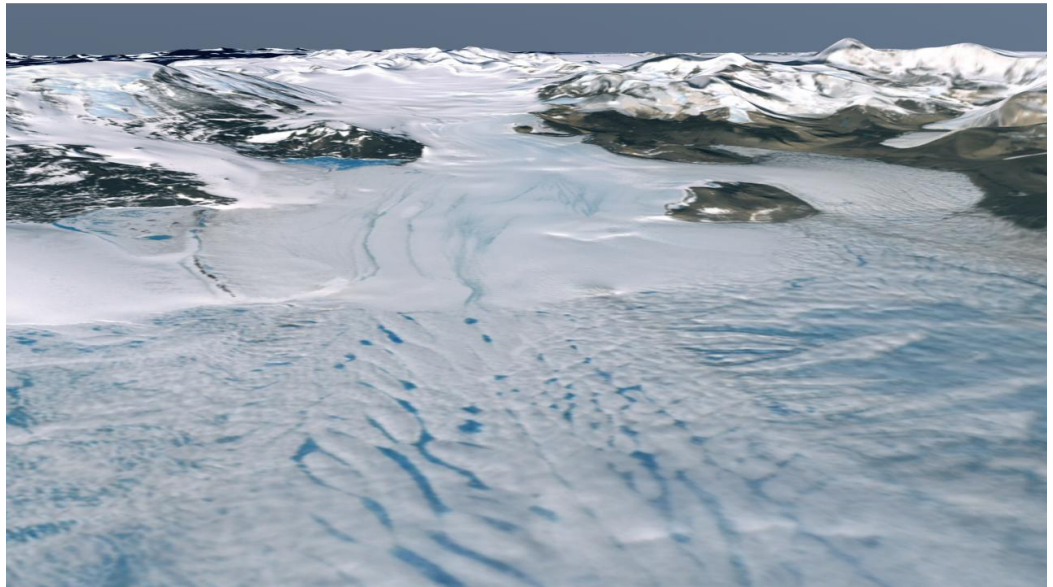
LIMA (2007)

3-D views of Koettlitz Glacier:

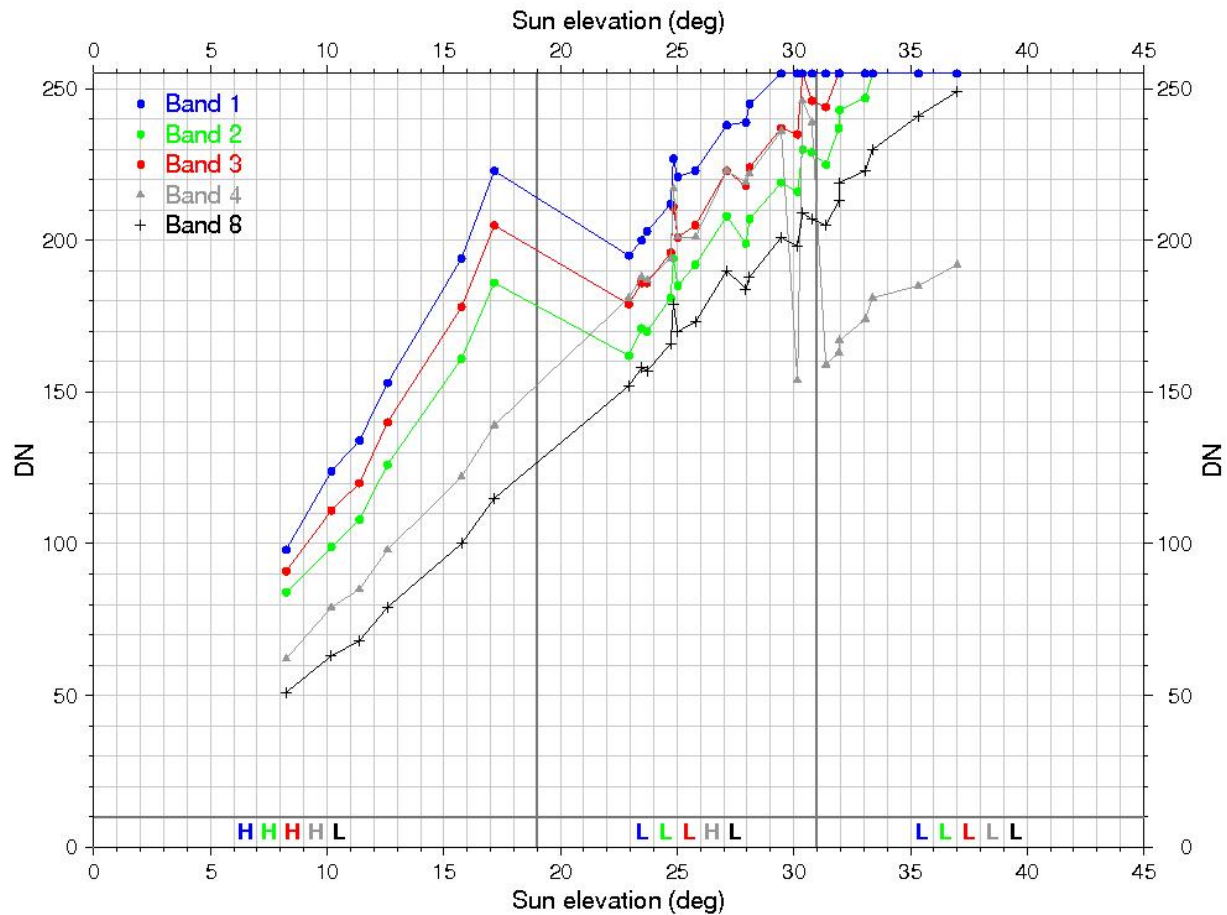
MOA



LIMA



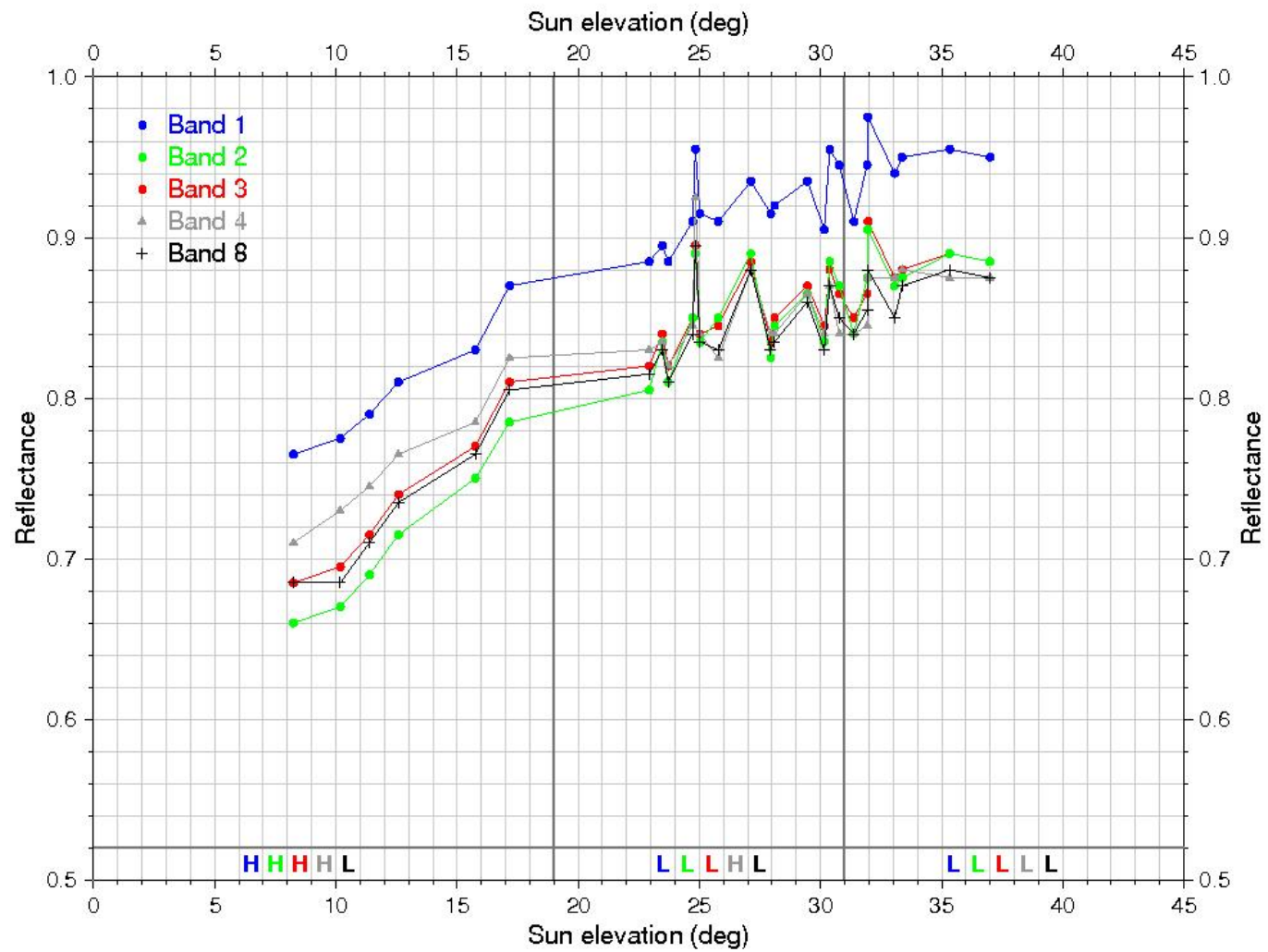
1. Adjust for saturation



Note consistent ratios

2. Convert to 'surface' reflectance

$$\rho = \frac{\pi L(\lambda) d^2}{E_s(\lambda) \cos \theta_s}$$



3. applied non-Lambertian correction.

This is as far as we could go with physically-based adjustments but the results were not perfect due to natural variations.

4. So next we “normalized” to align the histograms of scenes.

All adjustments are recorded in the metadata to ensure that the data would be scientifically useful.

5. Final manual adjustment of outliers

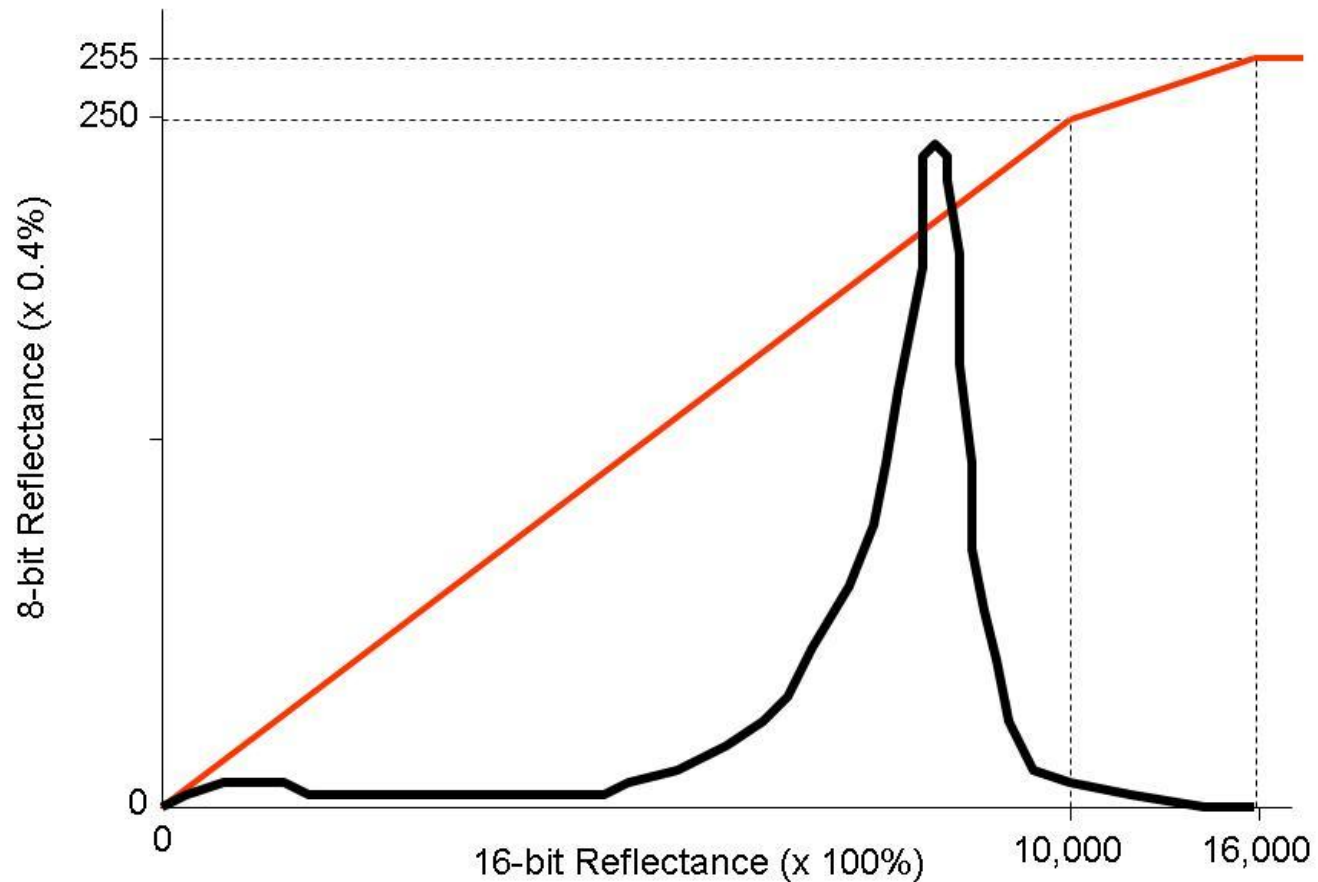
6. Pan-sharpening: simple, reversible

Final result is 16-bit values

Mosaicing

- Was done without ground control
(+/- 50m location accuracy with ephemeris data)
- stacking order and cutlines
- applied to all optical bands
- bands 321 and 432 color composites

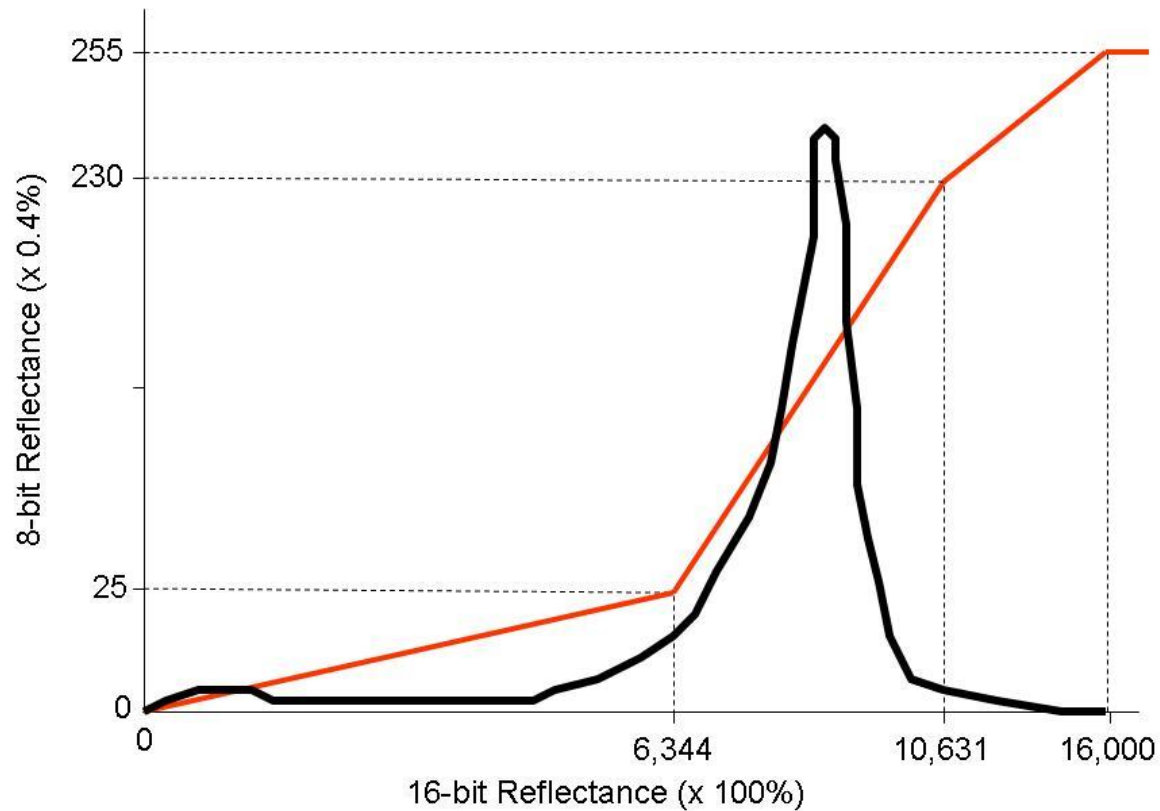
Enhancements



Our issues

- 8-bit quantization was the ultimate limit in precision
- Cloud discrimination over snow remains an issue. No operational algorithm is fully reliable
- LDCM is near-polar. Our blind spot is ~20% of the area of Antarctica

Enhancements



What we learned relevant to LDCM

- We need to collect **A LOT** of data
- A scientific product is possible without requiring the user to return to original data

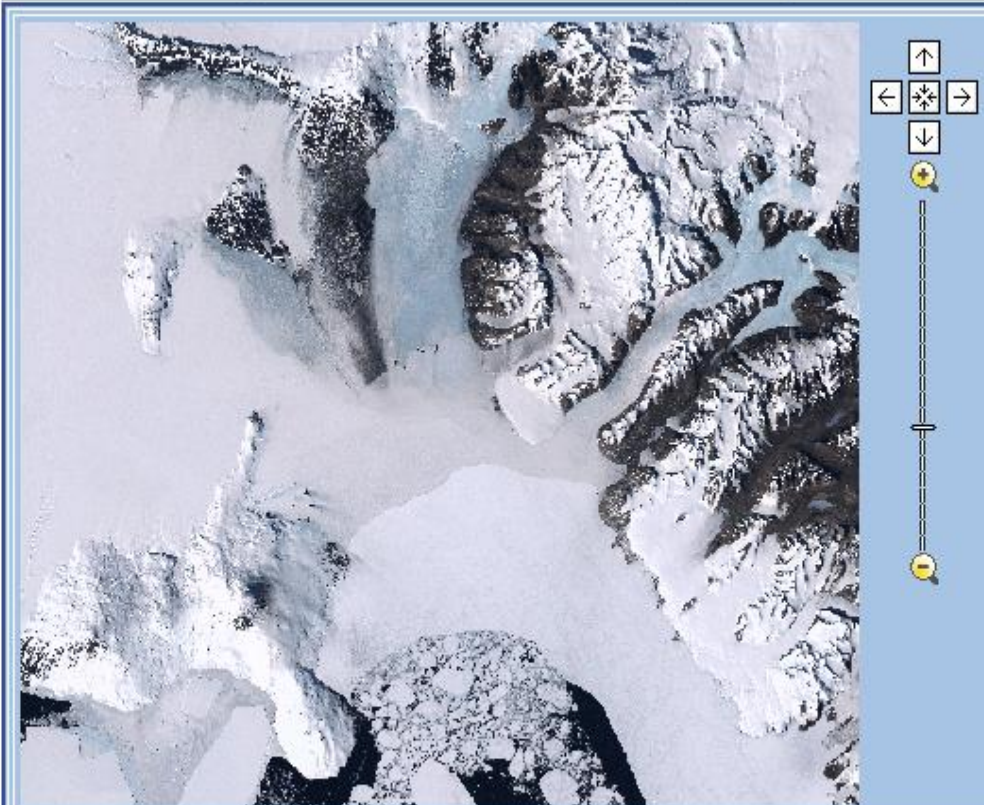


**British
Antarctic Survey**

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Landsat Image Mosaic Of Antarctica (LIMA)



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LANDSAT IMAGE MOSAIC OF ANTARCTICA

*Created for the International Polar Year 2007-2008.
Sponsored by the U. S. Geological Survey, National Science Foundation,
National Aeronautics and Space Administration, and the British Antarctic Survey.*

In support of the International Polar Year (IPY 2007-2008), LIMA brings the coldest continent on Earth alive in greater detail than ever before through this virtually cloudless, seamless, and high resolution satellite view of Antarctica.

The U.S. Geological Survey (USGS), the British Antarctic Survey (BAS), and the National Aeronautics and Space Administration (NASA), with funding from the National Science Foundation (NSF), created LIMA from more than 1,000 Landsat ETM+ scenes.

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USGS Educational Resources

NASA Faces of Antarctica

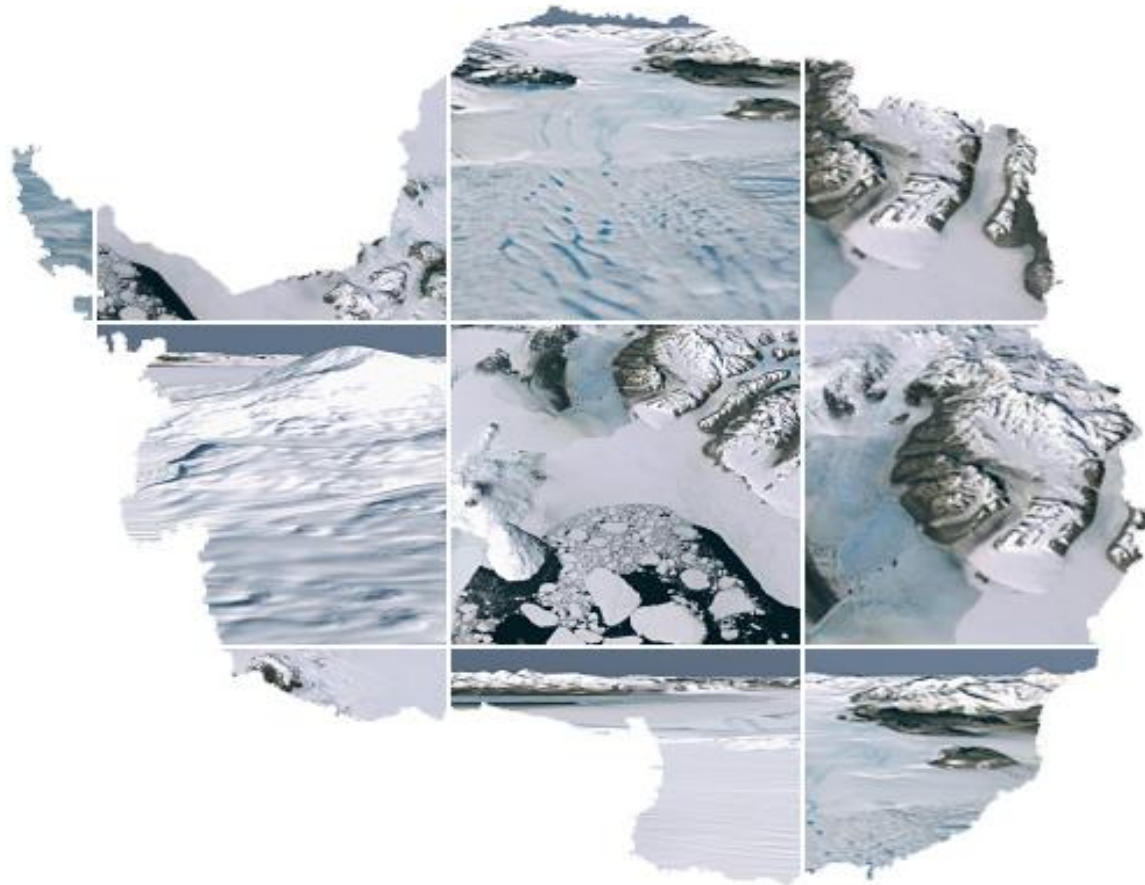
BAS Discovering Antarctica

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LIMA

Landsat Image Mosaic of Antarctica
Faces of Antarctica



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The Landsat Image Mosaic of Antarctica (LIMA) is the first-ever true-color high-resolution satellite view of the Antarctic continent enabling everyone to see Antarctica as it appears in real life. This web site is designed as part of the [International Polar Year](#) to familiarize people with Antarctica, to explore the richness of its features, to learn about why Antarctica matters to us all, and to explain and demonstrate how scientists use satellite imagery to study the continent.

This site is a two-year project. We plan to periodically add content. Your feedback is sought to help us in improving the site. [Please offer your suggestions.](#) Thank you.

THANK YOU !